The author has arranged this course of chemical experiments for students in high schools, academies and colleges. In the first half of the book the usual experiments upon the preparation and properties of the non-metallic elements are given, while the latter half consists of a series of analytical tables giving the behavior of solutions of metallic salts under the influence of the various reagents. The laboratory directions in the first part are upon the whole clearly stated, but they are marred by the excessive use of abbreviations and formulas. For example, in experiment 34 the student is directed to "connect the flask with a large t. t. or with a rec. which contains no water, and from this t. t. or rec. have a d. t. leading to a p. t. so as to collect the gas over water." In the introduction, page xi., the students are instructed to keep notes in the following way: "I, ———, put the mixture into a t. t., adjusted a d. t., hung it to a r. s., and arranged so as to collect the gas in recs. over water in a p. t." Nearly everywhere in the book symbols are used instead of the names of substances. Surely to encourage pupils to imitate this example is to confirm them in slovenly habits.

Another feature of the book to which exception must be taken is that entirely too much attention is given to 'tests.' The main idea seems to be to give the 'tests' for each substance, and a pupil taking this course would most likely get the idea that practical chemistry consists in finding the 'tests' for various substances. There is not in the whole course a single experiment which serves to elucidate any one of the fundamental laws of the science.

Such a method of teaching chemistry to beginners cannot be recommended. Instead of teaching them to distinguish ferrocyanides from ferricyanides, tartrates from oxalates, it would be much better for them to study the chemistry of common things, of air, water and fire, and this study should not be confined to the qualitative side of the phenomena observed. It is not impossible to teach beginners how certain chemical changes can be studied quantitatively and to arrange a course of experiments for them so that they shall acquire some knowledge of the chief laws and principles of the science.

E. H. KEISER.

Einführung in die mathematische Behandlung der Naturwissenschaften. Kurzgefasstes Lehrbuch der Differential- und Integralrechnung mit besonderer Berüchsichtigung der Chemie. By W. NERNST and A. SCHÖNFLIES. München und Leipzig, E. Wolff. 1895. Pp. xi+309.

One of the authors of this book, W. Nernst, is professor of physical chemistry at the University of Göttingen; his collaborateur, Professor Schönflies, is attached to the department of mathematics at the same seat of learning. This union of forces has been a fortunate one, for the writers have certainly succeeded in carrying out their intention of facilitating the study of the higher mathematics for students of natural science.

The keynote of the authors' purpose is sounded in the following lines, which they introduce in their preface as a quotation from H. Jahn's recent publication on electro-chemistry: "Even chemists must gradually grow accustomed to the thought that theoretical chemistry will remain for them a book with seven seals, unless they shall have mastered the principles of higher mathematical analysis. A symbol of differentiation or integration must cease to be an unintelligible hieroglyphic for the chemist * * * if he would not expose himself to the danger of losing all understanding of the delopments of theoretical chemistry.

"For it is a fruitless endeavor to attempt, by lengthy descriptions, to elucidate—even partially—that, which an equation conveys to the initiated in a single line."

The opening chapter discusses the principles of analytic geometry. After a few introductory remarks on graphic methods of presenting experimental results, and after having referred to the axes of coördinates, abscissa and ordinate, quadrants, etc., loci and their equations are considered. The circle, the parabola, the straight line, the ellipse, receive due attention, examples and problems being given to illustrate the discussions.

The second chapter is devoted to the fundamental principles of differential calculus. The introductory paragraph of this chapter —on the principles of the higher mathematics and the methods of consideration employed in the natural sciences—is well worthy

the perusal of any scientist, no matter in what direction his interests may be enlisted.

Following this are chapters on the differentiation of simple functions; integral calculus and its applications; higher differential equations and the functions of variables; infinite series and Taylor's series; the theory of maxima and minima; solution of numerical equations; examples from mechanics and thermo-dynamics. Collections of problems and formulæ precede the index, which completes the volume.

The aim of this book is fully expressed by its title; its scope is indicated by the above summary of its contents.

Although not a pioneer in this particular field—A. Fuhrmann's Naturwissenschaftliche Anwendungen der Differential-rechnung was published in 1888, the appearance of this treatise must be pronounced most opportune. It is certainly deserving of a cordial welcome, and mastery of its contents can not fail to be of great value to all who have not already appreciated the important bearing of the higher mathematics on numerous problems of natural science.

FERDINAND G. WIECHMANN.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON—257TH MEETING, SATURDAY, MARCH 7.

A PAPER on *the Influence of Fruit-bearing upon the Mechanical Tissue of the Twigs*, by Adrian J. Pieters, was, in the absence of the author, read by George H. Hicks. The author's conclusions, based on a study of twigs of the apple, pear, peach and plum were that the one-year-old fruit-bearing shoot of the apple and the pear has less wood in proportion to its diameter than does the vegetative shoot of the same age. This is due, in the apple largely, and in the pear solely, to a great increase in the cortex of the fruit-bearing shoot. It does not, however, appear from the structure of the shoots that the fruit-bearing shoot is weaker than the vegetative. The former is well supplied with supplementary mechanical tissue which is distributed at those points where it is most needed. This gives an increase of strength for the fruit-bearing year, which fully makes up for the small difference in xylem. In the peach the fruit-bearing shoot has more wood than the vegetative, and the walls of the wood cells are as thick in the former as in the latter.

In general it may be said that the effect of fruit-bearing upon the tissues is local. In the apple and pear it is felt throughout the one-year-old shoot; in the plum and peach it is confined to a small area in the immediate neighborhood of the fruit stalk.

The local effect on fruit-bearing is towards an increase of cells and a decrease in the thickness and lignification of the walls of the wood cells. The cortex is especially enlarged, giving rise in the apple and pear to the characteristic swollen condition of the fruit-bearing shoot.

In all cases the increase in growth is greatest on the side near the fruit stalk, although the wood in the apple and pear is best developed on the side of the lateral vegetative bud.

The effect which fruit-bearing exerts upon the xylem disappears with time. The study of apple shoots that had borne fruit in their first year showed that in the two or four years following there had been a rapid increase of wood, especially on the side of the fruit scar which was weakest at the end of the first year. At the end of three and five years these shoots had a better xylem development than shoots of the same age that had never borne fruit.

Fruit-bearing has a local effect upon the lignification of the walls of wood cells. It prevents their lignification wholly or in part according to their distance from the fruit stalk.

The lignification of other cell walls is promoted by fruit-bearing. In the fruit stalk the greatest part of the tissue has become lignified, and in the upper part of the apple and pear shoots there is an abundance of sclerenchyma and hard bast, which is either not found in the vegetative shoots or only in small amounts.

Dr. E. L. Greene presented a paper on *The Distribution of Rhamnus and Ceanothus in America*. Of the first named genus, the European *Rhamnus cathartica* being its type-species, some 100 species are recognized, these being distributed all around the northern hemisphere, chiefly within the temperate zone. In contrast with Europe, which has 23, North America north of